[0048] The number of buttons and Braille cells may be changed to meet the requirements of various applications. The number of buttons and Braille cells of this illustrative embodiment is merely a preferred number.

BRIEF DESCRIPTION OF THE DRAWINGS

[0049] For a fuller of the invention, reference should be made to the following detailed description taken, in connection with the accompanying drawings in which:

[0050] FIG. **1**A is a diagrammatic view of a prior art series bimorph reed;

[0051] FIG. **1**B is a diagrammatic view of prior art series bimorph reed;

[0052] FIG. **2**A is an illustration of the operation of a parallel bimorph reed in accordance with the present invention;

[0053] FIG. **2**B is an illustration of the operation of a parallel bimorph reed in accordance with the present invention;

[0054] FIG. **3** is a perspective view of the novel bimorph reed clip of this invention;

[0055] FIG. **4**A is a perspective view depicting the interconnection between a Braille cell assembly and a frame;

[0056] FIG. **4**B is a perspective like that of FIG. **4**A, but depicting three (3) Braille cell assemblies secured to the frame;

[0057] FIG. **5** depicts an exemplary interface that forms a part of the present invention;

[0058] FIG. **6**A is a perspective view of a first side of the novel Braille cell assembly;

[0059] FIG. **7**A is a top perspective view of the chassis/backplane of the novel Braille cell assembly;

[0060] FIG. **7**B is a bottom perspective view of the chassis/backplane of the novel Braille cell assembly;

[0061] FIG. **8**A is a perspective view depicting the interconnection between the Braille cell PCB and the top wall of the chassis/backplane;

[0062] FIG. **8**B is a perspective view of a set of novel Braille pins;

[0063] FIG. **9**A is a top perspective view of the novel cell cap;

[0064] FIG. **9**B is a bottom perspective view of the novel cell cap;

[0065] FIG. **10** is a perspective view of the chassis/backplane bottom wall;

[0066] FIG. **11** is a perspective view of a novel set of buttons;

[0067] FIG. **12** is a perspective view of the novel double decade Braille cell assembly without the cell cap; and

[0068] FIG. **13** is a perspective view of the novel double decade Braille cell assembly with the cell cap.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0069] Referring briefly to FIGS. **1**A and **1**B, it will there be seen that prior art series x-polled bimorph **10** is excited on only one side of the element. In FIG. **1**A, the reference numeral **10** denotes the bimorph when no voltage is applied thereto. A bimorph is made of two strips of conductors that expand longitudinally at different expansion rates when voltage is applied thereto. Accordingly, conductors **12** and **14** share a common length when no voltage is applied thereto as depicted in FIG. **1**A.

[0070] In FIG. **1**B, 200 volts is applied to prior art bimorph **10**. In this particular example, the expansion rate of conductor **14** exceeds that of conductor **12** so that the length of conductor **14** exceeds that of conductor **12** when voltage is applied to conductor **12**. Bimorph **10** therefore becomes curved. The amount of curvature increases in direct relation to an increase in applied voltage. No voltage is applied to the central electrode in a series-polled bimorph.

[0071] Turning now to FIGS. **2**A and **2**B, there it will be seen that this invention discloses the use of parallel polled bimorphs **20** in Braille cell assemblies as distinguished from the prior art series polled bimorphs. The novel parallel polled bimorph design harnesses the power of bimorph technology by driving both sides of the piezo bender with a common voltage of the same polarity, as depicted diagrammatically in FIGS. **2**A and **2**B, and by grounding the central conductor. Novel bimorph **20** includes top plate **22**, bottom plate **24**, and internal or central conductor **26**. Any applied voltage in the range from zero (0) to two hundred fifty (250) volts is within the scope of this invention.

[0072] A novel virtual bimorph ground, established by grounding the center conductor, eliminates the prior art need for custom drive electronics to drive both positive and negative high voltage cells. Moreover, the novel parallel polled bimorphs enable the provision of common electrical contact between top and bottom plates **22** and **24**, respectively. Said top and bottom plates **22**, **24** are electrically isolated from one another

[0073] As depicted in FIGS. **2**A and **2**B, the top and bottom elements **22**, **24** of y-polled bimorph **20** are polarized in a common direction. This configuration enables busing the outer conductors and driving internal strip **26**. With this method, both top and bottom piezo elements **22**, **24** are properly biased so that they work together. A novel "virtual ground" is created at 100V to enable the existing drive electronics to operate this superior piezo technology. Other voltages for the establishment of the virtual ground are within the scope of the invention.

[0074] The use of parallel bimorphs enables busing of piezo strips **22** and **24**. A simplified clip providing mechanical stability and electrical contact may therefore be used, without requiring special metallic plating. More particularly, the top and bottom plates are electrically isolated from one another by novel bimorph clip denoted **30** as a whole in FIG. **3**. Clip **30** includes top horizontal wall **32** and bottom horizontal wall **34**. Top horizontal wall **32** is soldered to PCB **36** and has an arm that extends downwardly to linear contact area **32***a* and upwardly therefrom. Conversely, bottom horizontal wall **34** is also soldered to PCB **36** and has an arm that extends upwardly to linear contact area **34***a* and downwardly therefrom. The space between contact area **32***a* and **34***a* is slightly less than the thickness of bimorph reed **20**. Each arm is formed of an electrically conductive flexible and resilient material and said arms are inherently biased toward one another so that a bimorph reed **20** disposed in sandwiched relation therebetween is firmly engaged thereby. Bimorph clip **30**, being integrally formed with PCB **36**, secured bimorph reed **20** to said PCB.

[0075] The invention is not limited to the depicted design of clip **30**. A wide variety of other bimorph reed clip designs providing mechanical stability and electrical contact is within the scope of the invention. Bimorph reed clip **30** is designed for the surface mount technology (SMT) process to avoid manual placement of the part. The bimorph reed clip also is mechanically ideal for piezo alignment and vibration.